



HEALTH AFFAIRS

THE ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, D. C. 20301-1200

MAR 29 2004

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY
(MANPOWER AND RESERVE AFFAIRS)
ASSISTANT SECRETARY OF THE NAVY
(MANPOWER AND RESERVE AFFAIRS)
ASSISTANT SECRETARY OF THE AIR FORCE
(MANPOWER AND RESERVE AFFAIRS)

SUBJECT: Policy Memorandum -- Human Immunodeficiency Virus Interval Testing

All Services shall modify their Human Immunodeficiency Virus (HIV-1) testing programs to provide a maximum two-year interval between routine tests for active duty personnel. Reserve component personnel shall be required to have a current HIV-1 test within two years of the date called to active duty for 30 days or more. The two-year interval HIV-1 testing requirement does not preclude testing prior to entering drug/alcohol rehabilitation programs and other risk-based or clinically-indicated HIV-1 testing. HIV-1 testing should remain available for all Service members upon their request without inquiring as to the reason for the test.

This modification in HIV-1 interval testing is based upon Armed Forces Epidemiological Board (AFEB) recommendations as detailed in the attached document. In its review, AFEB concluded that interval testing of military members for HIV-1 infection is valuable and should continue. The AFEB found a two-year testing interval allows for the detection of nearly all seroconverting Service members before they experience significant immune suppression and is sufficient to meet all military and healthcare needs.

This memo supersedes the requirement for HIV testing within 12 months of deployment prescribed by the October 6, 1998 Health Affairs policy memorandum (Health Affairs Policy 9902). Predeployment blood sample collection requirements will proceed as directed by Department of Defense (DoD) Instruction 6490.3. While HIV testing of the pre-deployment serum sample is no longer necessary, serum collected as part of HIV-1 interval testing may be used to meet pre- or post-deployment serum sample collection requirements if it facilitates the collection, handling, and ultimate storage of samples in the DoD Serum Repository.

HA POLICY: 04-007

The serum from all interval HIV-1 tests of Service members shall be forwarded to the DoD Serum Repository for storage.

My point of contact for this subject is Lt Col Roger Gibson, who may be reached at (703) 681-1703.



William Winkenwerder, Jr., MD

Attachments:

As stated

cc:

Surgeon General of the Army

Surgeon General of the Navy

Surgeon General of the Air Force

Assistant Secretary of Defense, Reserve Affairs

Director of Health and Safety, US Coast Guard

Deputy Director of Medical Readiness, J-4, Joint Staff



DEPARTMENT OF DEFENSE
ARMED FORCES EPIDEMIOLOGICAL BOARD
5108 LEESBURG PIKE
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DEC 24 2002

AFEB

MEMORANDUM FOR

Assistant Secretary of Defense (Health Affairs)
Surgeon General of the Army
Surgeon General of the Navy
Surgeon General of the Air Force

SUBJECT: Testing Interval for Human Immunodeficiency Virus (HIV-1) Infection in Military Personnel – 2003-05

1. Reference memorandum, Deputy Assistant Secretary of Defense, Clinical and Program Policy, 18 June 2002, Screening Interval for HIV Testing in the U. S. Military.
2. The Armed Forces Epidemiological Board (AFEB) met on 17 and 18 September 2002 to consider a request submitted to the Board by the Deputy Assistant Secretary of Defense for Clinical and Program Policy to review current U. S. military HIV testing intervals. Specifically, the Board was asked to:
 - Review pertinent medical literature and comment on the value of interval testing for HIV.
 - Recommend an appropriate interval for HIV testing, if the Board feels interval testing has value.
3. To address the questions the Board first requested and received briefings on or reviewed information about: a) Current military operational HIV testing requirements, b) Current HIV testing programs for the military services and the U. S. Coast Guard, c) Prior Board recommendations on HIV, and d) DoD HIV testing program findings. Second, a subcommittee of the Board's Infectious Disease committee reviewed relevant medical literature, and queried military HIV and infectious disease specialists using a "Framing Questions" document.
4. Upon review of the presentations, literature review, and questionnaire responses, the Board determined the following:
 - a. The most important reason for HIV interval testing is to identify HIV infected personnel as early as possible in the course of their illness in order to allow effective intervention with anti-retroviral drugs and other measures, and to preclude deployment overseas and the inherent associated risks. This rationale is important for both the individual service member's health, and the fitness and deployability of the military forces. Interval HIV testing is part of a broad range of routine service member health screenings that include physical examinations,

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physical fitness determinations, behavioral screening, screening for breast and cervical cancer, testing for tuberculosis, and determination of members' lipid profiles, among others.

b. The medical literature consistently demonstrates that although the average time from HIV infection to the development of AIDS is 10 years, a number of individuals develop AIDS far sooner. The progression to AIDS is directly related to both the depression in CD4⁺ T-lymphocyte count (CD4⁺ count) and the HIV viral load. For any given CD4⁺ count, the greater the viral load, the higher the percentage of individuals who will develop AIDS in the next few years. The Multicenter AIDS Cohort Study (MACS) data (as adapted and summarized in Dybul M, et al. *Guidelines for using antiretroviral agents among HIV-infected adults and adolescents*. Ann Intern Med, 2002; 137:381-433, page 423, Table 5) demonstrate this. For individuals presenting with a CD4⁺ count of ≤ 200 , 14-86 percent will develop an AIDS-defining illness by three (3) years, and 29-98 percent by six (6) years. If the CD4⁺ count is 201-350, the respective figures are 7-64 percent and 20-89 percent. If the count is > 350 , the respective figures are 2-40 percent and 6-72 percent. Within any of the three CD4⁺ count ranges, higher viral loads predict a higher percentage of AIDS-defining illness.

c. HIV seroconversion associated with a symptomatic, mononucleosis-like illness is associated with a more rapid disease progression.

d. U.S. Army and Navy HIV testing data compiled in the early 1990s demonstrated that a number of military personnel presented with low CD4⁺ counts. Approximately 40-45 percent presented with CD4⁺ counts < 500 , 11 percent presented with counts < 300 , and 3-4 percent presented with counts < 200 . The HIV testing frequency at this time should have allowed detection of most military members early in the course of their illness.

e. U.S. military HIV testing data from the Henry M. Jackson Foundation on 220 military members from the three services who seroconverted in the last four years is presented in Table 1. Testing frequency ranged from 1-5 years, and the data include CD4⁺ counts and HIV viral load measurements. These data further demonstrate that a significant proportion of HIV positive military personnel present with an advanced degree of immune suppression. Of the 220, 60 (27 percent) presented with a CD4⁺ count ≤ 350 , and 18 (8 percent) presented with a count ≤ 200 . Of the 220, 105 (48 percent) presented with a viral load $\geq 20,000$. This includes 78 (49 percent) of the 160 service members presenting with a CD4⁺ count > 350 . Further, 42 (26 percent) of 220 presented with a viral load of $> 55,000$, including 42 (26 percent) of those with a CD4⁺ count > 350 . (Military HIV data supporting this recommendation were obtained from different databases. It was not feasible to link databases which incorporate the reason for testing with those incorporating the presenting CD4⁺ counts and viral loads, although as Figure 2 demonstrates, few HIV positive service members were tested for clinical reasons.)

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f. A critical consideration for this question is the role of early treatment with HIV anti-retroviral pharmaceuticals. Frequent testing may promote early treatment by identifying individuals early in the course of their illness. Several military HIV and infectious disease specialists argued strongly for early treatment, whereas others had reservations as to its value. The literature and thinking on this issue, as concisely summarized in an editorial (Cohen OJ. *Antiretroviral therapy: Time to think strategically*. Ann Int Med 2000; 132:320-322), suggest that this is a rapidly evolving field with no one answer that is applicable to all HIV infected individuals. (Indeed, the changes in treatment recommendations are sufficiently frequent that there is a web site to make them rapidly available.) Regardless of the rationale for and against early treatment, it is important for military members to be identified as early as possible to allow them to take advantage of the most current recommendations.

g. Viral loads (and by implication increased transmission) are elevated early in the course of infection. Routine testing provides an opportunity for reducing HIV sexual transmission by instituting early anti-retroviral treatment. The Rakai study demonstrated that treating an individual with a CD4⁺ count of 300 had a 90 percent chance of keeping the viral load below detectable levels. HIV transmission at that level occurs in about 1 per 33,000 sexual encounters, compared to 1 per 1,000 encounters in untreated individuals (Gray RH, et al. *Probability of HIV-1 transmission per coital act in monogamous heterosexual, HIV-1 discordant couples in Rakai Uganda*. Lancet 2001; 357:1149-1153). (This rationale for early treatment could be influenced by changing recommendations for instituting early treatment.)

h. Routine testing provides an opportunity for counseling and other interventions to reduce HIV transmission. "Safe sex" orders and the sometimes severe punishment that can result from violating these orders are a deterrent to behavior that may transmit HIV, such as sex without a condom. Several studies among U.S. military personnel (Booth-Kewley S, et al. *A behavioral intervention to prevent sexually transmitted diseases/human immunodeficiency virus in a Marine Corps sample*. Mil Med 2002; 167:145-50; Booth-Kewley S, et al. *One-year follow-up evaluation of the sexually transmitted diseases/human immunodeficiency virus intervention program in a Marine Corps sample*. Mil Med 2001; 166:987-95; Boyer CB, et al. *Prevention of sexually transmitted diseases and HIV in young military men: evaluation of a cognitive-behavioral skills-building intervention*. Sex Transm Dis 2001; 28:349-55) have demonstrated that education and cognitive skill training have at least a short term preventive benefit in reducing risky sexual behaviors. Other studies have demonstrated that counseling reduced transmission among gay white men, but not among gay black men or IV drug users. Evidence that potential punishment for violating a "safe sex" order reduces unsafe behavior is only anecdotal. It is limited to recitations of individuals sent to prison, who clearly were not deterred. Despite uncertainty as to the degree of its benefit, counseling seems a prudent and accepted preventive public health measure, and should be continued.

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i. Military personnel receive mandatory immunizations. Immune suppression is generally considered a contraindication to receiving live virus and bacterial vaccines, notably smallpox, oral typhoid, BCG, and yellow fever. The individual's immune status is also important for predicting immune response to most vaccines. A lower CD4⁺ reduces the antibody response to many vaccines, including influenza, hepatitis A, and hepatitis B vaccines (Castelli F, Patroni A. *The human immunodeficiency virus-infected traveler*. Clin Infect Dis. 2000; 31:1403-8; Tasker SA, Wallace MR. *Vaccination in HIV-infected patients*. Curr Infect Dis Rep. 2000; 2:245-256). Data are limited on the efficacy in immune suppressed persons of other vaccines such as Japanese encephalitis or tickborne encephalitis, which may be warranted for deployment to areas of specific risk, or vaccines used in response to biological warfare threats including anthrax vaccine.

j. The Board examined other HIV testing rationales, some of which date from the institution of testing almost 20 years ago.

(1) Protection of the "walking blood bank". Deployed military units transfuse untested whole blood infrequently – 54 units in Kosovo, 14 in Bosnia, 29 in Enduring Freedom, and an unknown number during Desert Shield/Storm. These figures could increase markedly during sustained high intensity combat. Nevertheless, HIV transmission by this route would appear to be a relatively low risk since there are no known infections associated with past emergency transfusions of whole blood and the incidence of HIV seroconversion among military members is relatively low (Table 1). Rapid HIV screening in the field may soon become available, and the services have frozen blood programs.

(2) Protection against blood exposure while rendering "buddy first aid". Healthcare workers have a 0.3 percent chance of infection after a percutaneous exposure to HIV infected blood (Bell DM. *Occupational risk of human immunodeficiency virus infection in healthcare workers: an overview*. Am J Med 1997;102(suppl 5B):9-15.), and 0.09 percent after a mucous membrane exposure (Ippolito G, et al. *The risk of occupational human immunodeficiency virus infection in health care workers*. Arch Intern Med 1993;153:1451-8). Although this information was derived from a different setting, and "buddy first aid" in the field may involve non-medical personnel, it appears that this activity too presents a low risk for HIV transmission. The relative safety of the "walking blood bank" reinforces this argument.

(3) Exposure of HIV infected personnel to exotic diseases in a field environment with limited medical care. Infections associated with travel and military operations in developing countries and remote environments pose particular risks for HIV infected individuals. Most infectious diseases are either more frequent or more serious in immune compromised individuals. Service members could acquire a number of acute and chronic infections, e.g. cryptosporidiosis, *Isospora belli* infection, leishmaniasis, and tuberculosis that may become

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manifest in a more severe form or could become active as immune suppression progresses. However, “exotic” infections are infrequent among deployed military members, and many of these can also be acquired in the United States.

(4) Requirement of some countries that U.S. military personnel entering the country be HIV negative. A review of SOFA, UN, and NATO requirements did not uncover any requirement for mandatory HIV screening. The UNAIDS Best Practice Collection, which deals with peace keeping forces, calls for voluntary testing accompanied by appropriate counseling. (Some countries require HIV testing prior to immigration to the country.)

(5) HIV infection may reduce physical fitness. There is no evidence that HIV infection, per se, affects physical fitness. Opportunistic infections and other manifestations of AIDS may reduce fitness.

k. HIV testing costs are an important consideration. Calculating HIV testing costs is more complex than simply tallying the cost of various laboratory contracts. HIV testing involves numerous additional indirect cost elements including: loss of training/work time, phlebotomy services, serum sample preparation, serum sample preservation, sample shipping, sample tracking, recalling military personnel for repeat testing, counseling HIV positive individuals, etc. However, estimating the costs for these additional elements is prohibitive for these analyses. Realizing that there are currently numerous reasons for HIV testing, and that the Services have quite different HIV testing programs and costs, the Board has chosen to simplify the HIV testing cost data by using only the laboratory or contract direct cost data and reporting our findings by cost per HIV test, total annual cost, and cost per HIV positive service person identified. The Board realizes that this is a substantial underestimate of the total program cost. Table 2 demonstrates significant cost differences among testing agencies. Some of these differences may be attributed to differences in the number of tests performed (i.e. in general the Navy tests more frequently than does the Air Force) and utilization of contract services rather than in-house capabilities (i.e. the Navy and Army utilize contract services where the Air Force uses in-house laboratory capabilities). Combining all DoD HIV testing under one contract or at a single laboratory might reduce overall HIV testing costs.

l. The Board found that the incidence of HIV infection, as measured by HIV testing in each of the Services, has stabilized over time at approximately two (2) per ten thousand person-years (Figure 1). Although there are differences among the Services, in general the risk of becoming a HIV seroconverter is markedly lower for uniformed personnel in comparison to estimates of their civilian counterparts. Service members are also more likely to become HIV infected at home than on deployment. (Brodine SK, et al. Drug resistance patterns, genetic subtypes, clinical features, and risk factors in military personnel with HIV-1 seroconversion. *Ann Intern Med* 1999 Oct 5;131(7):502-6.; Garland FC, et al. Lack of association of human

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immunodeficiency virus seroconversion with visits to foreign ports in US Navy personnel. Arch Intern Med 1993 Dec 13;153(23):2685-91.)

m. Board members also found it interesting that the frequency distribution of reasons for HIV testing among HIV positive individuals differed by Service. These included: referred HIV contact; general force testing; clinically indicated; physical examination; requested by individual; sexually transmitted disease visit, etc. Data from the U.S. Army, Navy, and Air Force are compared in Figure 2 for the period 2000 through six months of 2002. General force testing identified more Navy HIV seroconversions while physical examinations identified more Air Force seroconversions. These differences in frequency are at least partially driven by differences in HIV testing policy. Navy force screening policy requires annual testing while the Air Force requires testing at least every 5 years. (Air Force personnel may be tested more frequently due to mobility requirements).

5. Based upon the best available medical evidence including the peer-reviewed literature and consideration of unique military operational requirements the following recommendations are made concerning the questions to the Board related to testing for HIV:

a. **Interval testing of military members for HIV infection is valuable, and should be continued. Routine independent program evaluation remains worthwhile and the Board would be willing to review this issue again in several years, if desired, and to provide revised recommendations if indicated.**

b. **An appropriate and acceptable interval is every two years. This interval allows the detection of nearly all seroconverting military members before they become significantly immune suppressed. It also allows military healthcare providers to implement “early” antiretroviral therapy and counseling to reduce HIV transmission.**

c. **There is a plethora of testing schedules and requirements, which vary by Service, occupational specialty, and unidentifiable parameters. The rationale for this variation is seldom articulated, and many schedules and testing requirements appear arbitrary. A testing interval of every two years should be sufficient for all military, deployment, and healthcare needs, except for clinically indicated testing. It would increase the efficiency and decrease the cost of testing. It would work to ensure that all members actually are tested by reducing the opportunity for missed tests due to confusion as to when to test a given individual. Resources could probably be saved because of economy of scale and reporting simplified if there was a single testing contract or laboratory.**

d. **Testing, including appropriate follow-up testing if indicated, should be required for all members who enter a drug or alcohol rehabilitation program, become pregnant, or develop a sexually transmitted infection, and whenever clinically indicated. Testing should**

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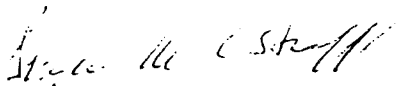
be performed whenever a service member requests to be tested, without inquiring as to the reason for the request.

e. All military healthcare providers should be educated as to the signs and symptoms suggestive of an acute, seroconverting, retroviral illness, and the need to test for HIV infection, including follow-up testing.


f. Serum samples collected as part of the total force testing program should continue to be forwarded and stored in the DoD serum repository and all results from force testing should be reported and maintained as part of the Defense Medical Surveillance System.

6. The above recommendations were unanimously approved.

FOR THE ARMED FORCES EPIDEMIOLOGICAL BOARD:



STEPHEN M. OSTROFF, MD
AFEB President



JAMES R. RIDDLE, DVM, MPH
Colonel, USAF, BSC
AFEB Executive Secretary

5 Encls

1. Memorandum, Deputy Assistant Secretary of Defense, Clinical and Program Policy, 18 June 2002, Screening Interval for HIV-1 Testing in the U. S. Military.
2. Table 1: Presenting CD4 Count vs. Presenting Viral Load in 220 HIV Positive Military Personnel Number of Individual Service Members
3. Table 2: Approximate HIV-1 testing costs, by testing agency and function
4. Figure 1: Incidence of HIV-1 seroconverters, by testing agency
5. Figure 2: Source of HIV-1 positives, US Army, Navy and Air Force, 2000-2002

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SUBJECT: Testing Interval for Human Immunodeficiency Virus (HIV-1) Infection in Military Personnel – 2003-05

CF:

Board Members and Consultants (w/encl)

J4-MRD (w/encl)

ASD(FM&P) (w/encl)

ASD(ISA) (w/encl)

MEPCOM (w/encl)

DODMERB (w/encl)

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HEALTH AFFAIRS

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
1200 DEFENSE PENTAGON
WASHINGTON, DC 20301-1200

JUN 18 2002

MEMORANDUM FOR EXECUTIVE SECRETARY, ARMED FORCES
EPIDEMIOLOGICAL BOARD

SUBJECT: Screening Interval for HIV Testing in the U. S. Military

The current DODD for HIV requires interval screening for HIV. The Navy tests annually; the Army tests approximately every two years; and the Air Force tests every three to five years, in addition to Service-specific pre and post deployment screenings requirements. There are no known evidence-based recommendations for interval screening for HIV.

I request the AFEB review existing DOD and Service-specific (including Reserve and National Guard), HIV policies and statistics (including Army Medical Surveillance Activity information), and any pertinent medical literature, and comment on the value of interval screening for HIV. If the Board identifies value in interval testing, I would appreciate a recommendation on what the appropriate frequency of HIV screening should be. My point of contact for DOD HIV policy issues is Ms. Lynn Pahland, who may be reached at (703) 681-1703: Lynn.Pahland@ha.osd.mil.

David N. Tomberg, MD, MPH
Deputy Assistant Secretary of Defense
Clinical & Program Policy

Attachments:
As stated



Table 1

Presenting CD4 Count vs. Presenting Viral Load in 220 HIV Positive Military Personnel
Number of Individual Service Members *

CD4 Count (cells/cumm)	Viral Load (copies/ml)				TOTAL
	< 20K	20K-55K	55K-100K	> 100K	
< 200	9	2	3	4	18
201-350	24	9	6	3	42
> 350	82	36	25	17	160
TOTAL	115	47	34	24	220

* Data provided by CAPT Glenn Schnepf and the Henry M. Jackson Foundation for the period July 1998 -
September 2002 Results are from the initial evaluation after HIV seroconversion

Table 2

Approximate HIV-1 testing costs, by testing agency and function

Testing Agency	Screening Test	Confirmatory Test	Total Annual Costs	Number HIV-1 positive persons detected	Cost per HIV-1 positive person identified
Army*	\$3.42	\$51.88	\$1,760,600	97	\$18,150
Navy†	\$3.76	\$46.93	\$1,886,345	101	\$18,676
Air Force‡	\$1.69	\$57.86	\$555,000	49	\$11,328
MEPS§	\$2.32	\$32.27	\$894,835	236	\$3,791

Screening test = Initial ELISA testing.

Confirmatory test = Repeat ELISA testing of initially reactive samples and confirmatory Western Blot testing

MEPS = Military Entrance Processing Station

* 2002 data obtained from COL Noel Webster. Includes Active Army, USAR, and Coast Guard. Does not include Army National Guard or tests conducted in Europe (approximately 54,000 tests annually).

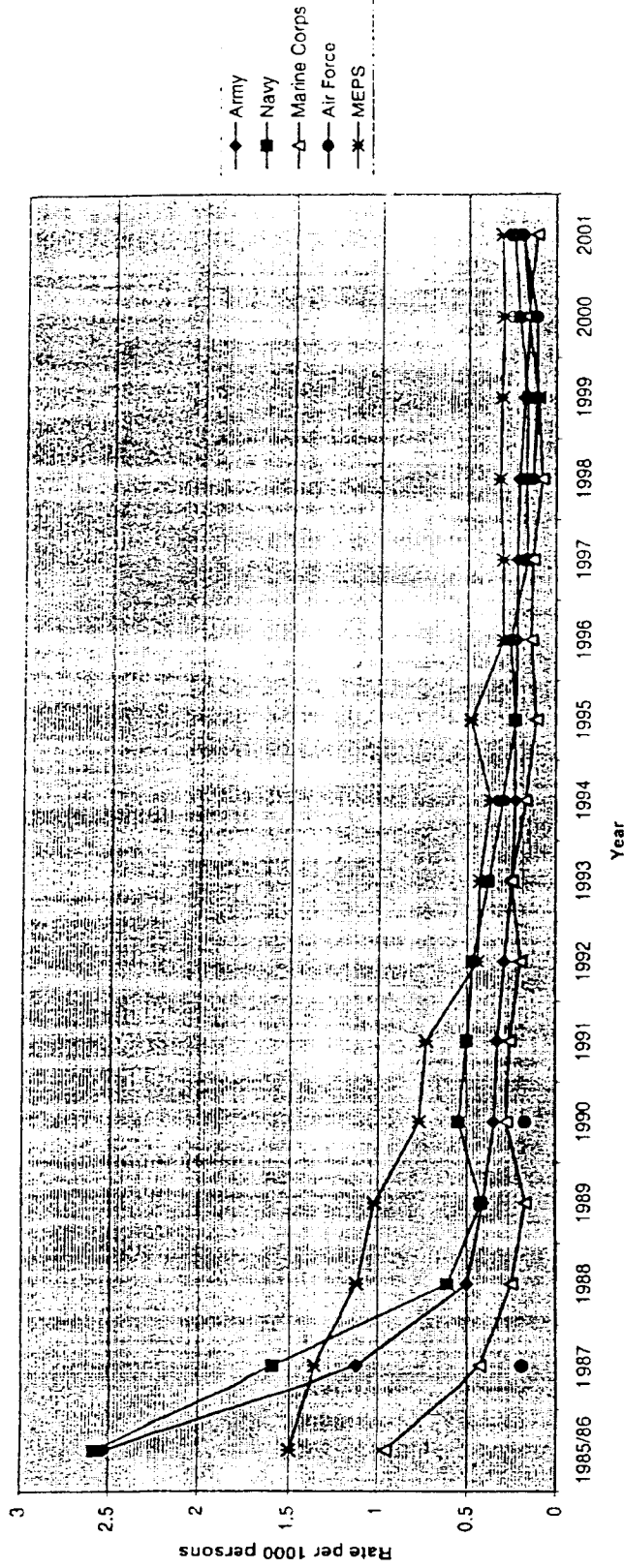
† 2001 data obtained from CAPT Glenn Schnepf and Ms. Jacqueline Sheffield. Includes Navy and Marine Corps.

‡ FY02 data obtained from Ms. Pat Cruse and Colonel James Neville. Air Force HIV-1 Force Testing is done in-house as opposed to contract as with Army, Navy and MEPS. The "Negative Test" cost is the burdened per-test cost for one screening test that shows a negative result. A particular specimen may go all the way through to Western blot before being determined to be negative, in which case the cost would be much higher. The "Positive Test" cost is burdened and includes 4 screening or preliminary tests and the Western blot. Data include Active duty Air Force, Air National Guard and Reserve personnel (this makes up 75.2 percent of the total HIV-1 workload).

§ Data from Ms. Carolyn Carson and Col Bradford Lee, October 2001 through August 2002. MEPS program deals with applicants not service members.

Figure 1

Incidence of HIV Seroconvertors, by Testing Agency *†‡



* Data provided by LTC(P) Mark Rubertone, MD, MPH, Chief, Army Medical Surveillance Activity, USACHPPM.

† Navy and Marine Corps data for 1985 - 1989 provided by the Naval Health Research Center, San Diego, CA.

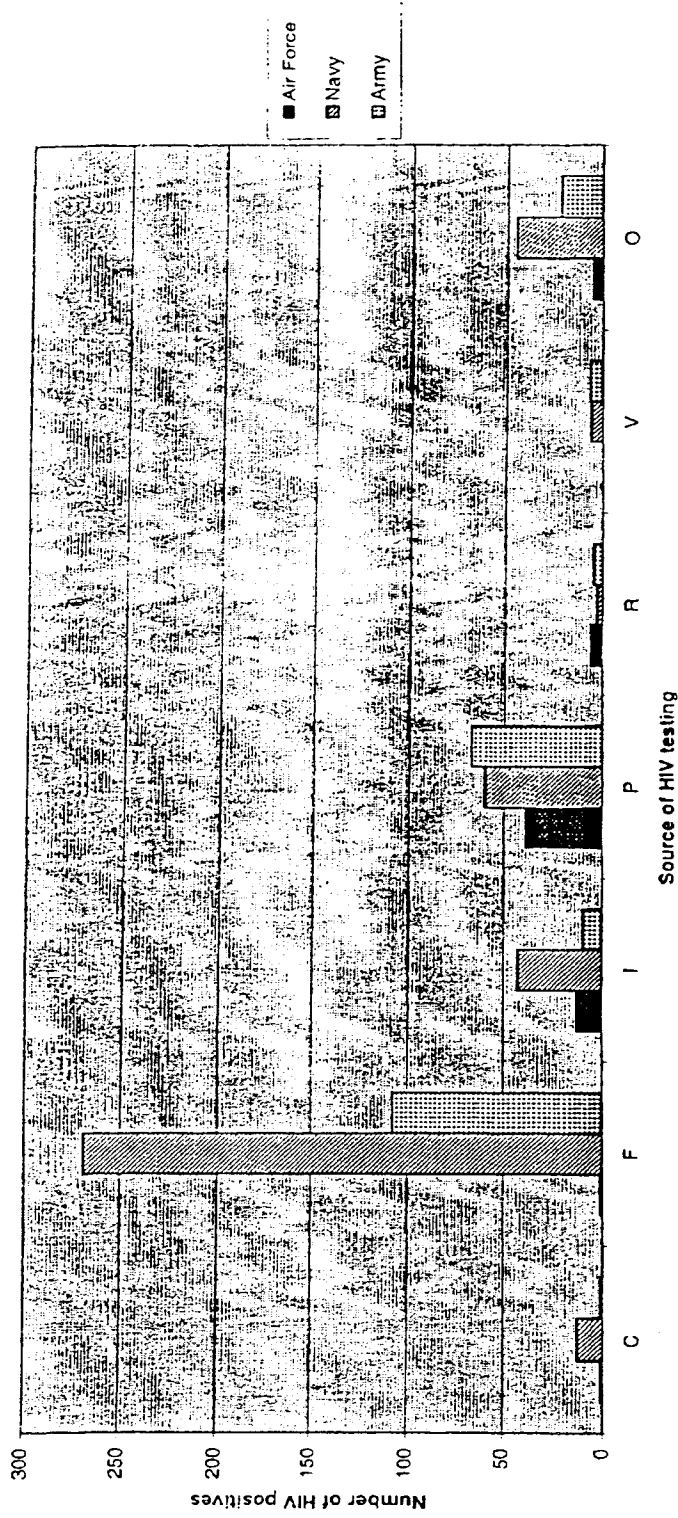
‡ Navy and Marine Corps data for 1990 - 2001 provided by Navy Testing Contractor, ViroMED Laboratories, Inc., Minneapolis, MN.

§ Air Force data for 1987 and 1990 from Warner et al. Estimates of human immunodeficiency virus (HIV) incidence and trends in the US Air Force. Vaccine. 1993;11(5):534-7.

1. Satercn, W., et al. Human Immunodeficiency Virus Seroconversion Trends Among Men and Women Serving in the United States Army, 1985 - 1998. 240 infected in 7,202,450, IR = 0.17, (95% CI = 0.16-0.18). The highest incidence: 1985/86, IR = 0.42. After 1985, decline, and in 1994 IR = 0.11, essentially unchanged since 1994. In comparison, for the same time frame, LTC(P) Rubertone gave the decreasing range of 2.53 in 1985 to 0.21 for 1998. This study reported a lower rate, ~ -0.10 less per 1000 for the 90's period.
2. Renzullo, P., et al. HIV-1 Subtypes Among Civilian Applicants for U.S. Military Service, 1989-1998: An Epidemiological Approach with Implications for Vaccine Research: 1989 to 1998, out of 3,927,971 civilian applicants 2196 tested positive for HIV-1, IR = 0.56/1,000 (95% CI = 0.54-0.58). In comparison, for the same time frame, LTC(P) Rubertone gave the decreasing range of 1.02 in 1989 to 0.32 for 1998. This study found a higher rate, ~+ 0.10 more per 1000 for the 90's period.
3. Direct blood donation testing data is not included for any of the years. Armed Services Blood Program Office reports for 2000 and 2001 include 9 and 16 HIV-1 confirmed positive donations, respectively.

Figure 2

Source of HIV Positives, US Army, Navy and Air Force, 2000-2002*



Army = Active duty and Reserve personnel
 Navy = Navy and Marines Corps, active duty and Reserve personnel
 Air Force = Active duty, Air National Guard and Reserve personnel
 * 2002 = data reflect only 6 months

C = Referred HIV contact; F = General forces testing; I = Clinically indicated; P = Physical examination; R = Requested by individual; V = Sexually transmitted disease visit; O = Other indication

Army data obtained from LTC(P) Mark Rubertone
 Navy data obtained from CAPT Glenn Schnepf and Ms. Jacqueline Sheffield
 Air Force data obtained from Ms. Pat Cruse and Colonel James Neville